PRELIMINARY AMENDMENT
U.S. Appln. No. 09/686,959
ATTORNEY DOCKET NO. Q61232

REMARKS

Claims 1-97 are now all the claims pending in the application. As shown above, certain of the originally-filed claims have been amended for improved idiomatic expression. New claims 50-97 have been added so as more fully to claim the invention in accordance with its appropriate scope. The specification has been amended to correct certain minor informalities and to ensure appropriate antecedent basis for all of the terms used in the claims. No new matter has been added.

Applicant encloses herewith an Appendix with markings to show changes made to the claims and to the specification.

Applicant respectfully requests of the Examiner a prompt and favorable action on the merits.

If the Examiner feels that the disposition of the application could be expedited by speaking with Applicant's representative, the Examiner is respectfully invited to **call the undersigned attorney** at the number shown below.

Applicant files herewith an Excess Claim Fee Payment Letter.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

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Date: February 28, 2001

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Page 20, at the beginning of the page.

The backup memory 36 functions as the temperature information storing means or temperature information storing section of the present invention, and comprises a storing section 46 for storing the head temperature information obtained by the sensor I/F 33 and a power source supplies section 47 constituted of a secondary cell, a capacitor and the like. The power source supplies section 47 functions as power source supply means, and supplies a backup power source to the storing section 46 in order to hold stored contents even during the time when the main power source is turned off.

Page 21, beginning at line 8.

As shown in Fig. 4, the control section 38, other than the above-described constitution, comprises an ink reservation amount obtaining means 61, temperature change amount obtaining means 62 and ink consumption controlling means 63. It will be appreciated that these components may also be referred to as an ink reservation amount obtaining section, a temperature change amount obtaining section, and an ink consumption controlling section.

Page 23, beginning at line 7.

Here, the driving signal generating circuit or section 40 functions as the driving signal generating means in the present invention, and generates a driving signal for working the piezoelectric element 23 of the recording head 11. For example, the circuit generates a driving signal (COM) in which a plurality of driving pulses are connected in series as shown in Fig. 7(a).

Page 37, beginning at line 6.

The ink consumption amount controlling means or section 63 controls the flushing of the recording head 11 to control ink consumption accompanied with ink ejection during flushing. Concretely, in response to the temperature change amount of the recording head obtained by the temperature change amount obtaining means 62 and the ink reservation amount obtained by the ink reservation amount obtaining means 61, the ink consumption amount controlling means 63 selects specified adjustment data from the preparatory ejection operation adjustment data stored in the wrong 37 to control the preparatory ejection controlling means 64 based on the selected adjustment data. Thus, the ink consumption amount controlling means 63 adjusts the driving signal of the flushing, the number of ejection times and intervals, ejection cycles and the like per one flushing.

Page 43, beginning at line 29.

In the above-described embodiments 1 to 6, the ink consumption amount ejected from the recording head 11 during the recording operation and the preparatory ejection operation or controlled based on the ink reservation amount in the temperature change amount. However, in the embodiment 7, a micro-vibration drive controlling means for making the recording head 11 perform the micro-vibration drive that educates the ink in the pressure chamber 24 and a changing means for adjusting the control of this micro-vibration drive controlling means based on the ink reservation amount and the temperature change amount are further provided. It will be appreciated that the micro-vibration drive controlling means may be referred to also as a micro-vibration drive controlling section and that the changing means may be referred to as a changing section.

IN THE CLAIMS:

25. (Amended) An ink-jet recording method, in which the ink-jet recording apparatus has a recording head for ejecting ink from an ink reservoir and driving signal generating means for generating a driving signal to eject droplets, the method comprising the steps of:

obtaining the ink reservation amount in said ink reservoir and obtaining the temperature change amount of said recording head; and

controlling the ink consumption amount of said recording head based on the temperature change amount of said recording head and said ink reservation amount.

34. (Amended) The ink-jet recording method according to claim 33, wherein in said step of obtaining the temperature change amount of the recording head, the temperature change amount is obtained by using the stored detected head temperature ~~information held in the temperature information storing means~~, when the power source is turned on again within a specified time after the power source is turned off.

36. (Amended) The ink-jet recording method according to claim 35, wherein said adjustment of the driving signal of the recording operation ~~is adjustment~~is an adjustment of the driving voltage for the pulse form, which is included in the driving signal for ejecting ink droplets.

37. (Amended) The ink-jet recording method according to claim 35, wherein said adjustment of the driving signal of the recording operation ~~is adjustment~~is an adjustment of the pulse form of the driving pulse, which is included in the driving signal for ejecting ink droplets.

40. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for the preparatory ejection operation ~~is adjustment~~is an adjustment of the pulse form for the ejection in said preparatory ejection operation.

41. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for the preparatory ejection operation ~~is adjustment~~is an adjustment of the number of rejections and said preparatory ejection operation.

42. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for said preparatory ejection operation ~~is adjustment~~is an adjustment of the interval of said preparatory ejection operation.

45. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive ~~is adjustment~~is an adjustment of the pulse form for the micro-vibration in said micro-vibration drive.

46. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive ~~is adjustment~~is an adjustment of the pulse number of said micro-vibration drive.

47. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive ~~is adjustment~~is an adjustment of the driving interval of said driving signal.

48. (Amended) The ink-jet recording method according to claim 44, wherein the adjustment of the driving signal for performing said micro-vibration drive ~~is adjustment~~is an adjustment of the driving cycle of said micro-vibration drive.

49. (Amended) A computer program product for controlling the ink consumption amount of an ink-jet recording apparatus, comprising:

a recording medium capable of being read by a computer, and

~~which stores~~ a program of computer readable instructions adapted to enable the control of an ~~for controlling the ink consumption amount of the~~ ink-jet recording apparatus to perform the steps of:

executing printing by using a recording head ejecting ink from an ink reservoir~~;~~,

obtaining an ~~wherein said program makes the ink jet recording method obtained the~~ ink reservation amount in said ink reservoir~~;~~ ~~and the~~

obtaining a temperature change amount of said recording head~~;~~; and

controlling the ink consumption amount of the recording head based on ~~the~~said temperature change amount of said recording head and said ink reservation amount.

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IN THE CLAIMS:

Please enter the following amended claims:

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25. (Amended) An ink-jet recording method, in which the ink-jet recording apparatus has a recording head for ejecting ink from an ink reservoir and driving signal generating means for generating a driving signal to eject droplets, the method comprising the steps of:

obtaining the ink reservation amount in said ink reservoir and obtaining the temperature change amount of said recording head; and

controlling the ink consumption amount of said recording head based on the temperature change amount of said recording head and said ink reservation amount.

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34. (Amended) The ink-jet recording method according to claim 33, wherein in said step of obtaining the temperature change amount of the recording head, the temperature change amount is obtained by using the stored detected head temperature, when the power source is turned on again within a specified time after the power source is turned off.

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36. (Amended) The ink-jet recording method according to claim 35, wherein said adjustment of the driving signal of the recording operation is an adjustment of the driving voltage for the pulse form, which is included in the driving signal for ejecting ink droplets.

37. (Amended) The ink-jet recording method according to claim 35, wherein said adjustment of the driving signal of the recording operation is an adjustment of the pulse form of the driving pulse, which is included in the driving signal for ejecting ink droplets.

40. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for the preparatory ejection operation is an adjustment of the pulse form for the ejection in said preparatory ejection operation.

41. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for the preparatory ejection operation is an adjustment of the number of rejections and said preparatory ejection operation.

42. (Amended) The ink-jet recording method according to claim 39, wherein said adjustment of the driving signal for said preparatory ejection operation is an adjustment of the interval of said preparatory ejection operation.

45. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the pulse form for the micro-vibration in said micro-vibration drive.

46. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the pulse number of said micro-vibration drive.

47. (Amended) The ink-jet recording method according to claim 44, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the driving interval of said driving signal.

48. (Amended) The ink-jet recording method according to claim 44, wherein the adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the driving cycle of said micro-vibration drive.

49. (Amended) A computer program product for controlling the ink consumption amount of an ink-jet recording apparatus, comprising:

a recording medium capable of being read by a computer, and

a program of computer readable instructions adapted to enable the control of an ink-jet recording apparatus to perform the steps of:

executing printing by using a recording head ejecting ink from an ink reservoir;

obtaining an ink reservation amount in said ink reservoir;

obtaining a temperature change amount of said recording head; and

controlling the ink consumption amount of the recording head based on said temperature change amount of said recording head and said ink reservation amount.

Please enter the following new claims.

50. An ink-jet recording apparatus, comprising:

a recording head, an ink reservoir, a drive signal generating section, an ink reservation amount obtaining section, a temperature change amount obtaining section, and an ink consumption amount controlling section;

said recording head receiving ink from said ink reservoir;

said drive signal generating section generating a driving signal;

said recording head ejecting ink droplets of said ink, based on said driving signal, at an ink consumption amount;

said ink reservation amount obtaining section obtaining an ink reservation amount in said ink reservoir;

said temperature change amount obtaining section obtaining a temperature change amount of said recording head; and

said ink consumption amount controlling section controlling said ink consumption amount of said recording head based on said temperature change amount and said ink reservation amount.

51. The ink-jet recording apparatus according to claim 50, wherein the ink consumption amount controlled by said ink consumption amount controlling section is the ink consumption amount by ink ejection and preparatory ejection.

52. The ink-jet recording apparatus according to claim 51, wherein the ink consumption amount controlled by said ink consumption amount controlling section further includes the ink consumption amount by a sucking operation.

53. The ink-jet recording apparatus according to claim 50, wherein said ink reservation amount obtaining section detects the ink consumption amount and obtains the ink reservation amount in said ink reservoir.

54. The ink-jet recording apparatus according to claim 53, wherein the ink consumption amount detected by said ink reservation amount obtaining section is the ejected amount of ink in a recording operation, the ejected amount of ink in a preparatory ejection operation and the sucked amount of ink in a sucking operation.

55. The ink-jet recording apparatus according to claim 50, wherein said temperature change amount obtaining section comprises a temperature detecting section for detecting the temperature of the recording head and a temperature information storing section for storing the head temperature information from the temperature detecting section.

56. The ink-jet recording apparatus according to claim 55, wherein said temperature information storing section stores the recording head temperature information from the time when a power source is turned on.

57. The ink-jet recording apparatus according to claim 55, wherein said temperature information storing section stores the head temperature information in the waiting state of the recording operation.

58. The ink-jet recording apparatus according to claim 55, wherein said temperature information storing section holds the stored head temperature information even after the power source is turned off.

59. The ink-jet recording apparatus according to claim 58, wherein said temperature change amount obtaining section obtains the temperature change amount by using the head temperature information held in the temperature information storing section when the power source is turned on again within a specified time after power source is turned off.

60. The ink-jet recording apparatus according to claim 50, wherein said driving signal generating section generates a driving signal that makes the recording head perform a recording operation, and said ink consumption amount controlling section adjusts the driving signal for the recording operation.

61. The ink-jet recording apparatus according to claim 60, wherein said driving signal generating section generates a driving signal including the driving pulse for ejecting ink droplets, and said ink consumption amount controlling section adjusts the driving voltage of the driving pulse based on the temperature change amount and the ink reservation amount.

62. The ink-jet recording apparatus according to claim 60, wherein said driving signal generating section generates the driving signal including the driving pulse for ejecting ink droplets, and said ink consumption amount controlling section adjusts the pulse form of the driving pulse based on the temperature change amount and the ink reservation amount.

63. The ink jet recording apparatus according to claim 60, wherein said recording head performs a preparatory ejection operation by using the driving signal of the recording operation.

64. The ink-jet recording apparatus according to claim 50, wherein said ink consumption amount controlling section adjusts control of the preparatory ejection operation.

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65. The ink-jet recording apparatus according to claim 64, wherein said ink consumption amount controlling section adjusts the pulse form for the ejection in said preparatory ejection operation.

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66. The ink-jet recording apparatus according to claim 64, wherein said ink consumption amount controlling section adjusts the number of rejections in one preparatory ejection operation.

67. The ink-jet recording apparatus according to claim 64, wherein said ink consumption amount controlling section adjusts the interval of said preparatory ejection operation.

68. The ink-jet recording apparatus according to claim 64, wherein said ink consumption amount controlling section adjusts the ejection cycle in said preparatory ejection operation.

69. The ink-jet recording apparatus according to claim 50, further comprising:

a micro-vibration drive controlling section for making ink in said recording head perform micro-vibration; and

a changing section for adjusting control of the micro-vibration drive controlling section based on the temperature change amount of the recording head obtained by said temperature change amount obtaining section and the ink reservation amount obtained by said ink reservation amount obtaining section.

70. The ink-jet recording apparatus according to claim 69, wherein said changing section adjusts the pulse form for the micro-vibration in said micro-vibration drive.

71. The ink-jet recording apparatus according to claim 69, wherein said changing section adjusts the pulse number of said micro-vibration drive.

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72. The ink-jet recording apparatus according to claim 69, wherein said changing section adjusts the drive interval of said micro-vibration drive.

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73. The ink-jet recording apparatus according to claim 69, wherein said changing section adjusts the drive cycle of said micro-vibration drive.

74. An ink-jet recording method, in which the ink-jet recording apparatus has a recording head for ejecting ink from an ink reservoir and a driving signal generating section for generating a driving signal to ejecting ink droplets, the method comprising the steps of:

obtaining the ink reservation amount in said ink reservoir and

obtaining the temperature change amount of said recording head; and

controlling the ink consumption amount of said recording head based on the temperature change amount of said recording head and said ink reservation amount.

75. The ink-jet recording method according to claim 74, wherein in said step of controlling the ink consumption amount, the ink consumption amount due to ink ejection and preparatory ejection is controlled.

76. The ink-jet recording method according to claim 75, wherein in said step of controlling the ink consumption amount, the ink consumption amount due to a sucking operation is further controlled.

77. The ink-jet recording method according to claim 74, wherein said ink reservation amount is obtained by calculation based on totalization of the ink consumption amount.

78. The ink-jet recording method according to claim 77, wherein said ink consumption amount is the ink ejection amount in the recording operation, the ink ejection amount in the preparatory ejection operation, and the ink sucking amount in the sucking operation.

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79. The ink-jet recording method according to claim 74, wherein said step of obtaining a temperature change amount of a recording head comprises the steps of:

detecting the temperature of said recording head; and

storing the detected head temperature information.

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80. The ink-jet recording method according to claim 79, wherein in said step of storing head temperature information, the head temperature information from the time when the power source is turned on the stored.

81. The ink-jet recording method according to claim 79, wherein in said step of storing the head temperature information, the head temperature information in the waiting state of the recording operation is stored.

82. The ink-jet recording method according to claim 79, wherein in said step of storing head temperature information, the stored head temperature information is held even after the power source is turned off.

83. The ink-jet recording method according to claim 82, wherein in said step of obtaining the temperature change amount of the recording head, the temperature change amount is obtained by

using the stored detected head temperature information, when the power source is turned on again within a specified time after the power source is turned off.

84. The ink-jet recording method according to claim 74, wherein in said step of controlling the ink consumption amount, the driving signal that makes a said recording head perform to recording operation is adjusted.

85. The ink-jet recording method according to claim 84, wherein said adjustment of the driving signal of the recording operation is an adjustment of the driving voltage for the pulse form, which is included in the driving signal for ejecting ink droplets.

86. The ink-jet recording method according to claim 84, wherein said adjustment of the driving signal of the recording operation is an adjustment of the pulse form of the driving pulse, which is included in the driving signal for ejecting ink droplets.

87. The ink-jet recording method according to claim 84, wherein said recording head is made to perform the preparatory ejection operation by using the driving signal of the adjusted recording operation.

88. The ink jet recording method according to claim 74, wherein in said step of controlling the ink consumption amount, the driving signal for performing the preparatory ejection operation is adjusted.

89. The ink-jet recording method according to claim 88, wherein said adjustment of the driving signal for the preparatory ejection operation is an adjustment of the pulse form for the ejection in said preparatory ejection operation.

90. The ink-jet recording method according to claim 88, wherein said adjustment of the driving signal for the preparatory ejection operation is an adjustment of the number of rejections and said preparatory ejection operation.

91. The ink-jet recording method according to claim 88, wherein said adjustment of the driving signal for said preparatory ejection operation is an adjustment of the interval of said preparatory ejection operation.

92. The ink-jet recording method according to claim 88, wherein said adjustment of the driving signal for said preparatory ejection operation is change of the ejection cycle in said preparatory ejection operation.

93. The ink-jet recording method according to claim 74, further comprising a step of adjusting the driving signal that makes the recording head perform micro-vibration.

94. The ink-jet recording method according to claim 93, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the pulse form for the micro-vibration in said micro-vibration drive.

95. The ink-jet recording method according to claim 93, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the pulse number of said micro-vibration drive.

96. The ink-jet recording method according to claim 93, wherein said adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the driving interval of said driving signal.

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97. The ink-jet recording method according to claim 93, wherein the adjustment of the driving signal for performing said micro-vibration drive is an adjustment of the driving cycle of said micro-vibration drive.